

A thin sanitary napkin (20) having a flexible border encircling the absorbent core is disclosed. The flexible border is formed by joining the backsheet (24) to the topsheet (22), either by crimping or heat sealing along a seam (34), outboard of the absorbent core (26). A soft flexible edge (51) along the back end of the sanitary napkin is provided by placing the seal or crimp inboard from the back edge of the flexible border so that non-bonded topsheet and/or backsheet materials exist between the backsheet/topsheet seam and the rear end edge of the flexible border. In an alternate embodiment, the topsheet/backsheet seam is located inboard of the entire peripheral edge (36) of the border (35) to provide a napkin having softer edges.

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## SANITARY NAPKIN HAVING SOFT EDGES

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### FIELD OF THE INVENTION

This invention is directed to disposable absorbent articles worn to assist in the collection of bodily discharges, more particularly to sanitary napkins for the collection of menstrual discharges, and even more particularly to sanitary napkins having edges which are soft and comfortable to the wearer.

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### BACKGROUND OF THE INVENTION

Sanitary napkins which collect menstrual fluids and other vaginal discharges and protect against soiling of the wearer's clothing and bedding are well known in the art. It has long been an object of sanitary napkins to readily intercept menses upon discharge from the wearer. In general, sanitary napkins all have the same basic structure: a liquid pervious user-contacting topsheet, a liquid impervious backsheet which prevents the escape of bodily discharges from the sanitary napkin, and an intermediate absorbent core, encased between the topsheet and backsheet, which absorbs bodily discharges.

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Typically, the topsheet and backsheet are extended beyond the periphery of the absorbent core and sealed together to fully enclose the absorbent core and prevent discharged bodily fluids, not absorbed by the absorbent core, from soiling any garments, clothing, bedding, etc., which are in close proximity of the

wearer's pudendal region. Unfortunately, although the napkin's peripheral backsheet/topsheet seal provides effective containment of discharged bodily fluids, the seal can also produce hard edges which cause discomfort to the wearer. The hard edges are particularly noticeable along the back end of the napkin (i.e., the edge of the napkin which comes into contact with the buttocks), with the discomfort being even more pronounced in thin, flexible, body conforming sanitary napkins.

Contemporary sanitary napkins have long had a means, typically pressure sensitive adhesive, for affixing the sanitary napkin to the undergarment of the wearer and maintaining the sanitary napkin in the proper position to intercept the discharged menses. However, the undergarment may not, in fact, move in concert with the body of the wearer. Specifically, the crotch of the undergarment of the wearer may not remain in constant registration with and position relative to the vaginal opening. Also, as the wearer spreads her legs, walks, sits, etc., the sanitary napkin may not flex and twist with the undergarment, further allowing the sanitary napkin to shift from the desired position and registration. Consequently, the hard edges of the sanitary napkin (resulting from the peripheral topsheet/backsheet seal) can cause considerable discomfort to the wearer as the sanitary napkin moves about and its edges press against the wearer's sensitive skin during use.

It has now been discovered that softer, more flexible edges can be obtained by locating the topsheet/backsheet seal inboard from the sanitary napkin's outer edges. The inset seal results in a sanitary napkin having non-bonded topsheet and/or backsheet material forming the outer edges of the sanitary napkin. This non-bonded material provides softer, more flexible edges compared to the relatively harsh edges found on conventional sanitary napkins wherein the backsheet and topsheet are sealed along the napkin's outer peripheral edges.

There have been numerous attempts made in the art, some more successful than others, to provide a sanitary napkin with softer, more comfortable edges. For example, U.S. Patent 3,881,490, Whitehead et al., issued May 6, 1975, discloses a sanitary napkin

in which the absorbent material in the core terminates at the peripheral edges of the napkin without being sealed in an enclosing wrapper. The resulting sanitary napkin, while providing comfortable soft edges for the user, suffers from the drawbacks of dusting of the short wood pulp fluff fibers from the unsealed edge areas as well as unsatisfactory leakage containment for medium to high menstrual flows. U.S. Patent 4,518,451, Luceri et al., issued May 21, 1985, discloses a C-folded sanitary napkin possessing soft longitudinal edges. However, due to the thickness of the longitudinal edges, the C-folded napkins do not conform particularly well to the perineal area of the female body and are thus less comfortable than napkins that are more body-contoured. Furthermore, because only the longitudinal edges are C-folded, the sanitary napkin will still possess relatively hard, uncomfortable transverse edges.

Therefore, there exists a real consumer need for a sanitary napkin which has comfortable, soft, flexible edges and also provides effective containment of discharged bodily fluids. This consumer need for soft, comfortable edges is particularly evident in thin, flexible, body conforming sanitary napkins.

It is an object of this invention to provide a sanitary napkin which has soft, flexible edges, thereby offering enhanced user comfort and which also is effective in absorbing and containing menstrual fluids and other vaginal discharges.

It is an additional object of the present invention to provide a sanitary napkin which is thin and flexible, has soft edges, and will offer enhanced fit, comfort and low degree of wearing awareness to the consumer.

These and other objects are obtained using the present invention as will be seen from the following disclosure.

#### SUMMARY OF THE INVENTION

The present invention comprises a sanitary napkin having a liquid pervious topsheet, a liquid impervious backsheet, and an absorbent core encased between the topsheet and the backsheet. The topsheet and backsheet are peripherally joined outboard of the absorbent core along a seam, the seam being spaced inboard of a transverse edge of the topsheet and/or the backsheet at least

about 1.0 mm. The topsheet/backsheet seam is preferably formed by crimping or heat sealing the materials together. The inset transverse seam results in unbonded topsheet/backsheet material forming one of the transverse end edges of the napkin. This non-bonded material provides a softer, more comfortable end edge for the wearer.

In a preferred embodiment, the sanitary napkin has a thin, flexible border encircling the absorbent core, the border extending from about 0.3 cm to about 2.0 cm outward from the absorbent core. The border is comprised of the portion of the topsheet and backsheet which extend beyond the periphery of the absorbent core. In a particularly preferred embodiment, the topsheet/backsheet seam is located inboard of the peripheral edge of the border at least about 1.0 mm. In other words, the outer peripheral edges of the sanitary napkin are comprised of unbonded topsheet/backsheet material and are therefore softer and more comfortable to the wearer.

#### BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a top plan view of a sanitary napkin, according to the present invention, with portions being torn away to show underlying structure.

Figure 2 is a longitudinal sectional view of the sanitary napkin embodiment shown in Figure 1 taken along line 2-2 of Figure 1.

Figure 3 is a transverse sectional view of the sanitary napkin embodiment shown in Figure 1 taken along line 3-3 of Figure 1.

Figure 4 is a top plan view of an alternately preferred sanitary napkin embodiment of the present invention with portions being torn away to show underlying structure.

Figure 5 is a top plan view of an alternately preferred sanitary napkin embodiment of the present invention.

Figure 6 is a longitudinal sectional view of an alternatively preferred sanitary napkin embodiment of the present invention taken along line 2-2 of Figure 1.

Figure 7 is a transverse sectional view of an alternatively preferred sanitary napkin embodiment of the present invention taken along line 3-3 of Figure 1.

#### DETAILED DESCRIPTION OF THE INVENTION

5 While this specification concludes with claims particularly pointing out and distinctly claiming that which is regarded as the invention, it is believed that the invention can be more readily understood through perusal of the following detailed description of the invention in combination with study of the associated  
10 drawings.

As shown in Figure 1, the invention comprises a disposable absorbent article, particularly a sanitary napkin 20. As used herein, the term "sanitary napkin" refers to an article which is worn by females adjacent to the pudendal region and which is  
15 intended to absorb and contain the various exudates which are discharged from the body (e.g., blood menses and urine) and which is intended to be discarded after a single use (i.e., it is not intended to be laundered or otherwise restored or reused). As used herein, the term "pudendal" refers to the externally visible  
20 female genitalia.

The sanitary napkin 20 has a generally centered longitudinal axis 14. As used herein the term "longitudinal" refers to an imaginary line, axis or direction of the sanitary napkin 20, which line, axis or direction is typically centered between the edges of  
25 the napkin 20 and is generally aligned with the vertical plane which bisects a standing wearer into left and right body halves. The term "transverse" refers to an imaginary line, axis or direction generally orthogonal the longitudinal direction and within the plane of the sanitary napkin 20, and is generally  
30 sideways aligned relative to the wearer.

The sanitary napkin 20 features a liquid pervious topsheet 22, a liquid impervious backsheet 24, and an absorbent core 26 intermediate the topsheet 22 and the backsheet 24. The topsheet 22 is joined to the backsheet 24 by attachment means as are well  
35 known in the sanitary napkin art. The attachment means may be, for example, crimping, heat sealing, hot melt adhesives, or ultrasonic bonding.

5 In a preferred manner and configuration of joining the  
topsheet 22 to the backsheet 24, the topsheet 22 and the backsheet  
24 are manufactured having a shape similar to but generally larger  
than the absorbent core 26. Thus, the topsheet 22 extends outward  
from the longitudinal edges 30 and transverse edges 31 of  
absorbent core 26. Similarly, the backsheet 24 extends outward  
from the longitudinal edges 30 and transverse edges 31 of  
absorbent core 26. The topsheet 22 and backsheet 24 are  
10 peripherally joined outboard of said absorbent core 26 along a  
seam 34, by any of the attachment means discussed above,  
preferably by crimping or heat sealing.

15 Figures 1 illustrates a top plan view of a sanitary napkin 20  
according to the present invention, and Figure 2 is a longitudinal  
sectional view of the sanitary napkin 20 taken along line 2-2 of  
Figure 1. As shown in Figure 1, the topsheet 22 has two  
longitudinal edges 28 and two transverse edges 29. Similarly, the  
backsheet 24 has two longitudinal edges 32 and two transverse  
edges 33. In a preferred embodiment, seam 34 is spaced inboard of  
at least one of said topsheet transverse edges 29 or one of said  
20 backsheet transverse edges 33 at least about 1.0 mm, more  
preferably from about 1.5 mm to about 15.0 mm, and most preferably  
from about 2.0 mm to about 10.0 mm. The inset transverse seam  
results in unbonded topsheet or backsheet material forming one of  
the napkin's transverse edges 39 as can best be seen in Figure 3.

25 Figure 3 is a transverse sectional view of sanitary napkin  
20, taken along line 3-3 of Figure 1. As shown in Figure 3, seam  
34 is spaced outboard of the transverse edge 31 of absorbent core  
26, and inboard of transverse edge 29 of topsheet 22 and  
transverse edge 33 of backsheet 24. Thus, unbonded topsheet 22  
30 and/or backsheet 24 will form one of the transverse edges 39 of  
napkin 20.

35 Unexpectedly, it has been discovered that locating the  
topsheet/backsheet seam inboard from the transverse edge of either  
the topsheet or the backsheet, results in a sanitary napkin with a  
much higher degree of comfort, particularly along the back end of  
the napkin (i.e., the edge of the napkin which comes into contact  
with the wearer's buttocks). The non-bonded material provides a



softer, more comfortable edge than found in sanitary napkins wherein the topsheet/backsheet seam extends to the outer, rear transverse edge of the napkin. [Although the greatest benefit of placing the seam inboard from the napkin's peripheral edges is realized at the rear end of the napkin, substantial comfort benefits are also realized by placing the topsheet/backsheet seam inboard of any or all of the other peripheral edges of the napkin as will be discussed hereinafter.]

As discussed above, the topsheet 22 and the backsheet 24 have length and width dimensions generally larger than the absorbent core 26 so that they extend beyond the edges 30 and 31 of the absorbent core 26 where they are peripherally joined outboard of said absorbent core 26 along seam 34. The extension of the topsheet 22 and the backsheet 24 beyond the absorbent core transverse edges 31 and the absorbent core longitudinal edges 30 form border 35 which encircles the absorbent core 26. The border has two transverse edges 51 and two longitudinal edges 52 which form the periphery 36 of sanitary napkin 20. [The border transverse edges 51 and longitudinal edges 52 will generally be the same as either the topsheet transverse edges 29 and longitudinal edges 28, and/or the backsheet transverse edges 33 and longitudinal edges 32, respectively, depending on the specific dimensions and geometry of the topsheet and backsheet.] Encircling the absorbent core 26 gives the border 35 a shape retaining character. While the border 35 has a shape retaining character, in use it is thin, flexible, comfortable, and readily conforms to the shape of the vicinity surrounding the point of liquid discharge such as the pudendal region of the body.

The border 35 provides improved protection against soiling of the vicinity surrounding the area of liquid discharge compared to the same sanitary napkin not having the border 35. Accordingly, the border 35 has a width sufficient to prevent discharged liquid which is not absorbed by the absorbent core 26 from soiling the garments, clothing, bedding, etc. which are in close proximity to the point of liquid discharge. For example, in a preferred embodiment, the border of the sanitary napkin 20 has a width sufficient to assure that the sanitary napkin 20 covers the crotch

area of the wearer's undergarments. The border 35 preferably extends outward from the transverse edges 31 and longitudinal edges 30 of absorbent core 26 a distance from about 0.3 cm to about 2.0 cm, more preferably from about 0.5 cm to about 1.5 cm, and most preferably about 1.0 cm. The border 35 may have a uniform width or may have a width which varies about the periphery 36 of sanitary napkin 20.

In a preferred embodiment, as shown in Figure 1, seam 34 is spaced inboard of at least one of said border transverse edges 51 at least about 1.0 mm, more preferably from about 1.5 mm to about 15.0 mm, and most preferably from about 2.0 mm to about 10.0 mm. In an alternate preferred embodiment, as shown in Figure 5, seam 34 is spaced inboard from the periphery 36 of said border 35 at least about 1.0 mm, more preferably from about 1.5 mm to about 15.0 mm, and most preferably from about 2.0 mm to about 10.0 mm. The inset peripheral seam results in a sanitary napkin having non-bonded topsheet and/or backsheet material forming the outer edges of the sanitary napkin. As previously discussed, the non-bonded material provides softer, more flexible edges compared to the relatively harsh edges found on conventional sanitary napkins wherein the backsheet and topsheet are sealed along the napkin's outer peripheral edges. In a preferred embodiment of the present invention, the border 35 extends from about 0.5 cm to about 1.5 cm outboard from said absorbent core and the seam 34 is spaced from about 2.0 mm to about 10.0 mm inboard from the periphery of said border.

Examining the components in more detail with continuing reference to Figure 1, the topsheet 22 is the component of the garment which is oriented towards and contacts the body of the wearer and receives bodily discharges. The topsheet 22 is liquid pervious and should be flexible and nonirritating to the skin. As used herein the term "flexible" refers to materials which are compliant and readily conform to the shape of the body or respond by easily deforming in the presence of external forces. Preferably the topsheet 22 is not noisy, to provide discretion for the wearer. The topsheet 22 should be clean in appearance and

somewhat opaque to hide the bodily discharges collected in and absorbed by the absorbent core 26.

5 The topsheet 22 should further exhibit good strikethrough and rewet characteristics, permitting bodily discharges to rapidly penetrate the topsheet 22 to the core 26, but not flow back through the topsheet 22 to the skin of the wearer. Suitable topsheets may be made from nonwoven materials and perforated polyolefinic films.

10 The topsheet 22 has a plurality of apertures to permit liquids deposited thereon to pass through to the core 26. An apertured polyolefinic film topsheet 22 having from about 5 to about 60 percent open area, typically about 25 percent open area, and a thickness of about 0.15 to about 0.7 millimeters is suitable.

15 If desired, the topsheet 22 may be sprayed with a surfactant to enhance fluid penetration to the core 26. The surfactant is typically nonionic and should be nonirritating to the skin. A surfactant distribution in an amount of about 0.01 milligrams per square centimeter of topsheet 22 area is suitable. A preferred  
20 surfactant for use in the present invention is Pegosperse 200 ML, sold by the Glyco Chemical, Inc. of Greenwich, Connecticut.

A particularly suitable topsheet 22 may be made in accordance with U.S. Patent 4,342,314, Radel et al., issued August 3, 1982 and U.S. Patent 4,463,045, Ahr et al., issued July 31, 1984 which  
25 patents are incorporated herein by reference for the purpose of disclosing particularly preferred executions of liquid pervious topsheets. A liquid pervious topsheet 22 made of model X-3265 or model P1552 apertured formed film sold by Tredegar Industries, Inc., of Terre Haute, Indiana has been found to work well.

30 The backsheet 24 may be any flexible, liquid impervious or liquid resistant material, such as a polyolefinic film, and prevents discharges collected by and contained in the sanitary napkin 20, particularly discharges absorbed by the core 26, from escaping the sanitary napkin 20 and soiling the clothing and  
35 bedding of the wearer. Preferably the backsheet 24 is not noisy, to provide discretion for the wearer.

The backsheet 24 may also be impervious to malodorous gases generated by absorbed bodily discharges, so that the malodors do not escape and become noticed by the wearer. A low density polyethylene backsheet 24 from about 0.15 to about 0.7 millimeters in thickness, preferably about 0.51 millimeters in thickness, has been found to work well. A polyethylene film, such as is sold by Tredegar Industries, Inc. under model XP-39385, has been found particularly well suited for this purpose.

Further, the backsheet 24 may be made of a soft clothlike material which is hydrophobic relative to the topsheet 22, e.g., a polyester or polyolefinic fiber backsheet 24 is suitable. A particularly preferred soft, clothlike backsheet 24 material is a laminate of a polyester nonwoven material lamina such as described in U.S. Patent 4,476,180, Wnuk, issued October 9, 1984, incorporated by reference herein. Nonwoven, hydro-entangled fiber fabric having a basis weight of about 37 grams per square meter is suitable. A suitable nonwoven fabric may be purchased from the International Paper Company, Veratec Nonwovens Group, of Walpole, Massachusetts, as zero strain fabric.

If desired, the outwardly oriented face of the backsheet 24 may comprise a means for attaching the sanitary napkin 20 to the undergarment of the wearer. Preferred attaching means include mechanical fasteners or, more preferably, pressure sensitive adhesive 48. As seen in Figure 2, the pressure sensitive adhesive 48 is preferably applied to the outwardly oriented face of the backsheet 24 in two parallel strips, one said strip of adhesive disposed on each side of the longitudinal axis of the backsheet 24. The adhesive strips may be from about 5 to about 20 millimeters in width. Alternatively, the adhesive may be applied to the backsheet 24 in a generally centered rectangular patch covering from about 30 to about 70 percent of the area of the outwardly oriented face of the backsheet 24. Another alternative, which will be discussed in greater detail hereinafter, is pressure sensitive adhesive 48 longitudinally centered and disposed near the distal end of each flap 44 (shown in Figure 4). Suitable pressure sensitive adhesive 48 is supplied as 0.02 mil pass Century Adhesive A305-4 by Anchor Continental, Inc. 3 Sigma

Division, of Covington, Ohio. Preferably, the adhesive 48 is covered by release paper (not shown) to prevent contamination and undesired attaching prior to use.

5 The absorbent core 26 is the means for collecting and containing bodily discharges, particularly menses, deposited thereon or which otherwise passes through the liquid permeable topsheet 22. The core 26 is the component of the sanitary napkin 20 which receives and retains the bodily discharges. The absorbent core 26 should be conformable and nonirritating to the  
10 skin. The core 26 may be rectangular or hourglass shaped. The core 26 preferably has two opposed faces, one oriented towards the backsheet 24 and one oriented towards the topsheet 22.

The absorbent core 26 may be manufactured from a wide variety of liquid absorbent materials commonly used in disposable sanitary  
15 napkins, diapers, and other absorbent articles. Examples of suitable absorbent materials include comminuted wood pulp which is generally referred to as airfelt, creped cellulose wadding, layers of tissue paper, absorbent foams, absorbent sponges, synthetic staple fibers, polymeric fibers, hydrogel-forming polymer gelling agents, or any equivalent materials or combinations of materials.  
20 If a tissue paper core is selected, tissue paper made in accordance with U.S. Patent 4,191,609, Trokhan, issued March 4, 1980, incorporated herein by reference, discloses a preferred tissue paper suitable for the sanitary napkin 20 described herein.  
25 Particularly preferred absorbent material are polymeric gelling agents. Polymeric gelling agents are those materials which, upon contact with fluids (i.e., liquids) such as water or body fluids, imbibe such fluids and thereby form hydrogels. In this manner, fluid discharged into the absorbent core 26 can be acquired and  
30 held by the polymeric gelling agent, thereby providing the articles herein with enhanced absorbent capacity and/or improved fluid retention performance.

The polymeric gelling agent will generally comprise particles of a substantially water-insoluble, slightly cross-linked,  
35 partially neutralized, hydrogel-forming polymer material. Such polymer materials can be prepared from polymerizable, unsaturated, acid-containing monomers. Suitable unsaturated acidic monomers

for use in preparing the polymeric gelling agents used in this invention include those listed in U.S. Patent 4,654,039, entitled "Hydrogel-Forming Polymer Compositions For Use In Absorbent Structures", which issued to Brandt, Goldman and Inglin on March 31, 1987, and which patent is incorporated herein by reference. Preferred monomers include acrylic acid, methacrylic acid, and 2-acrylamido-2-methyl propane sulfonic acid. Acrylic acid itself is especially preferred for preparation of the polymeric gelling agent material.

In the hydrogel-forming polymeric gelling agent the polymeric component formed from unsaturated, acid-containing monomers may be grafted onto other types of polymer moieties such as starch or cellulose. Polyacrylate grafted starch materials of this type are especially preferred for use herein.

Preferred polymer gelling agents which can be prepared from conventional types of monomers include hydrolyzed acrylonitrile grafted starch, polyacrylate grafted starch, polyacrylates, maleic anhydride-based copolymers and combinations thereof. Especially preferred are the polyacrylates and polyacrylate grafted starch.

Whatever the nature of the basic polymer components of the hydrogel-forming polymeric gelling agents used in the absorbent core 26 herein, such materials will in general be slightly cross-linked. Cross-linking serves to render the hydrogel-forming polymer gelling agents used in this invention substantially water-insoluble, and cross-linking thus in part determines the gel volume and extractable polymer characteristics of the hydrogels formed from the polymeric gelling agents employed. Suitable cross-linking agents are well known in the art and include, for example, those described in greater detail in U.S. Patent 4,076,663, which patent issued to Masuda et al. on February 28, 1978, and which patent is incorporated herein by reference. Preferred cross-linking agents are the di- or polyesters of unsaturated mono- or polycarboxylic acids with polyols, the bisacrylamides and the di- or triallyl amines. Especially preferred cross-linking agents are N,N'-methylenebisacrylamide, trimethylol propane triacrylate and triallyl amine. The cross-linking agent generally comprises from about 0.001 mole

percent to 5.0 mole percent of the resulting hydrogel-forming polymer material. More preferably, the cross-linking agent will comprise from about 0.01 mole percent to 3.0 mole percent of the hydrogel-forming polymeric gelling agent used herein.

5       The slightly cross-linked, hydrogel-forming polymeric gelling agents which may be used in the sanitary napkin of the present invention are generally employed in their partially neutralized form. For purposes of this invention, such materials are considered partially neutralized when at least 25.0 mole percent,  
10       and preferably at least 50.0 mole percent of monomers used to form the polymer are carboxylic acid group-containing monomers which have been neutralized with a salt-forming cation. Suitable salt-forming cations include alkali metal, ammonium, substituted ammonium, and amines. This percentage of the total monomer  
15       utilized which are neutralized acid group-containing monomers is referred to herein as the "degree of neutralization."

      The polymeric gelling agent materials used in the absorbent articles herein must have a relatively high capacity for imbibing fluids encountered in such articles. The absorbent capacity of  
20       these materials can be quantified by referencing the "gel volume" of the polymeric gelling agents which are to be selected for use in the present invention.

      For purposes of this invention, gel volume can be defined in terms of the amount of synthetic urine absorbed by any given  
25       polymeric gelling agent and is specified as grams of synthetic urine per gram of polymeric gelling agent. Gel volume in synthetic urine can be determined by forming a suspension of about 0.1-0.2 parts of dried polymeric gelling agent to be tested with about 20 parts of synthetic urine. This suspension is maintained  
30       at ambient temperature under gentle stirring for a time sufficient, e.g., about 1 hour, for swelling equilibrium to be attained. The gel volume of the polymeric gelling agent in grams of synthetic urine per gram of polymeric gelling agent is then calculated from the weight fraction of the polymeric gelling agent  
35       in the suspension and the ratio of the liquid volume excluded from the formed hydrogel to the total volume of the suspension.

The gel volume of the gelling agents used in the absorbent core 34 herein will generally be at least about 20.0 grams of synthetic urine per gram of polymeric gelling agent. More preferably, the gel volume of the materials employed will range from about 20.0 to about 60.0, most preferably from about 22.0 to about 35.0 grams of synthetic urine per gram of polymeric gelling agent.

Within the webs which form the layers of the absorbent core 26, the particles of the polymeric gelling agent should be thoroughly dispersed, but may or may not be uniformly distributed. In particular, there may be regions or zones of the core layers which have higher concentrations of gelling agent particles than do other regions or zones of the layers.

In a preferred embodiment, the sanitary napkin 20 of the present invention will have a hydrogel-forming polymeric gelling agent distributed throughout at least about 17.0 square centimeters of the napkin, more preferably throughout at least about 50.0 square centimeters of the napkin, and most preferably throughout at least about 100.0 square centimeters of the napkin. Preferably, the hydrogel-forming polymeric gelling agent will be distributed in an amount of from about 0.001 grams per square centimeter to about 0.009 grams per square centimeter, more preferably of from about 0.003 grams per square centimeter to about 0.008 grams per square centimeter, and most preferably from about 0.004 grams per square centimeter to about 0.007 grams per square centimeter. Preferably, the absorbent core 34 will contain from about 5.0% to about 85.0% by weight of hydrogel-forming polymeric gelling agent, more preferably from about 10.0% to about 70.0%, and most preferably from about 15.0% to about 55.0%.

In the preferred embodiment shown in Figure 2, the absorbent core 26 is a laminate comprised of a layer of superabsorbent polymer material disposed between two layers of tissues. A suitable laminate is the superabsorbent laminate WATER-LOCK L-535 available from the Grain Processing Corporation of Muscatine, Iowa (WATER-LOCK registered TM by Grain Processing Corporation). Such superabsorbent laminates are disclosed in U.S. Patent 4,467,012, entitled "Composition For Absorbent Film And Method Of



Preparation", which patent issued to Pedersen et al. on August 21, 1984, and U.S. Patent 4,260,443, entitled "Laminated Absorbent Process", which patent issued to Lindsay et al. on April 7, 1981, and which patents are incorporated herein by reference. The WATER-LOCK L-535 has a hydrogel polymer loading of 0.005 grams per square centimeter, however, loadings of 0.001 - 0.009 grams per square centimeter have been found acceptable. The two tissue layers provide containment of the superabsorbent polymer material, improve lateral wicking of the absorbed exudates throughout the absorbent core 26 and provide a degree of absorbency.

The core 26 need not have a total absorbent capacity much greater than the total amount of bodily discharges to be absorbed. The core 26 is preferably narrow and thin, to be comfortable to the wearer. For the embodiment described herein the capacity of the core 26 should be at least about 2 grams of 0.9 percent saline solution. Suitable saline solution is sold by Travenol Laboratories of Deerfield, Illinois.

As previously mentioned, the core 26 is preferably encased between the topsheet 22 and backsheet 24 to prevent the absorbent material of the core 26 from shredding or becoming detached while the sanitary napkin 20 is worn and to ensure proper containment of bodily discharges. This arrangement also provides for a unitary assembly.

Further, the sanitary napkin 20 preferably has a caliper of less than about 4 millimeters and more preferably less than about 2.6 millimeters, as measured with a comparator gauge having an approximately 80.0 gram test weight and an approximately 10.0 gram comparator foot having a diameter of about 2.54 centimeters and a contact surface area of approximately 5.1 square centimeters. Also, the sanitary napkin 20 of the present invention should have a topsheet 22 surface area of at least about 100 square centimeters to prevent discharged fluids from missing the target area.

The core 26 is preferentially joined to the topsheet 22, and may be joined to the backsheet 24. The term "joined" refers to the condition where a first member or component is affixed, or connected, to a second member or component either directly; or

indirectly, where the first member or component is affixed, or connected, to an intermediate member or component which in turn is affixed, or connected, to the second member or component. The joined relationship between the first member, or component, and the second member, or component, is intended to remain for the life of the sanitary napkin 20.

Joining is preferentially accomplished by adhesive bonding the core 26 to the topsheet 22 or the backsheet 24. The adhesive may be applied in any suitable spray pattern, such as a spiral, or in longitudinally oriented beads. The adhesive should be surfactant resistant and of low pressure sensitivity, so as not to stick to the skin of the wearer.

The sanitary napkin 20 may further comprise a wet-laid tissue 50 positioned between the topsheet 22 and the absorbent core 26. The wet-laid tissue 50 is liquid permeable. A suitable wet-laid tissue 50 has a basis weight of about 15.8 grams per square meter and an air permeability of about 30.5 cubic meters per minute per square meter at a pressure differential of about 12.8 millimeters of water. Preferably, the wet-laid tissue 50 maintains integrity in use when wetted. The wet-laid tissue 50 preferably has a wet tensile strength in the cross-direction of at least about 15.0 grams per centimeter. Suitable wet-laid tissues 50 and their manufacture are disclosed in U.S. Patent 3,301,746, entitled "Process For Forming Absorbent Paper By Imprinting A Fabric Knuckle Pattern Thereon Prior To Drying And Paper Thereof", which patent issued to Sanford and Sisson on January 31, 1967, and which patent is incorporated herein by reference. The wet-laid tissue 50 may be associated with the topsheet 22 by attachment means as are well known in the art such as by spray-gluing or lines or spots of adhesive.

The wet-laid tissue 50 serves a number of purposes. The tissue 50 serves to confine any loose superabsorbent polymer material between the tissue 50 and the topsheet 22 thereby preventing the superabsorbent material from coming in contact with the wearer's skin. Also, the tissue 50 improves lateral wicking of the absorbed exudates over the absorbent core 26 thereby providing a more even distribution of the exudates throughout the

absorbent core 26. Further, the tissue 50 provides some degree of absorbency and further inhibits exudates which have reached and been absorbed by the absorbent core 26 from rewetting the wearer's skin.

5 The sanitary napkin 20 may also comprise flaps 44 (first shown in Figure 4) extending away from the longitudinal axis 14 and central portion of the sanitary napkin 20. As used herein the phrase "central portion" refers to that part of the sanitary napkin 20 intermediate, particularly laterally intermediate, and defined by the proximal edges of the flaps 44.

10 Figure 4 is a top plan view of an alternatively preferred sanitary napkin embodiment of the present invention. In this embodiment, the sanitary napkin 20 has two flaps 44, each of which are adjacent to and extend laterally away from a longitudinal edge 38 of the sanitary napkin 20. The flaps 44 may be comprised of an integral and contiguous extension of the topsheet 22, the backsheet 24, or a laminate of both. Alternatively, the flaps 44 may be made of a separate and independent piece of material joined to the longitudinal edge 38 of the sanitary napkin 20.

15 The flaps 44 have a proximal end 45 which is typically coincident with the juncture of attachment to the longitudinal edge 38 of the sanitary napkin 20 or, the proximal edge may be joined to the sanitary napkin 20 at another location juxtaposed with the longitudinal edge 38. The flaps 44 extend laterally outwardly from the sanitary napkin 20 and terminate at a distal edge 46 which represents the point furthest from the longitudinal axis 34 of the sanitary napkin 20. The flaps 44 may be of any shape desired, with a particularly preferred shape being shown in Figure 4. The flaps 44 may also be made in accordance with the teachings of U.S. Patents 4,589,876, Van Tilburg issued May 20, 20  
20 1986 and 4,687,478, Van Tilburg, issued August 18, 1987, which patents are incorporated herein by reference.

25 The flaps 44 preferably have a means for attaching one surface of the flap 44 to the wearer's undergarment or to the other flap 44. The attachment means may be a mechanical fastener or, preferably, pressure sensitive adhesive 48. If pressure sensitive adhesive 48 is selected, it should be disposed on the  
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face of the flap 44 which is oriented away from the topsheet 22, so that when the flaps 28 are wrapped around the crotch portion of the wearer's undergarment the adhesive 48 will face the outside of the wearer's undergarment. Suitable pressure sensitive adhesive 48 is sold by the Anchor Continental, Inc., 3 Sigma Division of Covington, Ohio as 0.02 millimeter pass with Century Adhesive A305-4. Preferably the adhesive 48 is covered by release paper (not shown) to prevent contamination and undesired attaching prior to use.

A second alternative embodiment of the sanitary napkin 20 of the present invention is illustrated in Figures 6 and 7. Sanitary napkin 20 has the same top plan form illustrated in Figure 1, but has the longitudinal sectional view taken along line 2-2 as illustrated in Figure 6, and the transverse sectional view taken along line 3-3 illustrated in Figure 7. In this embodiment, sanitary napkin 20 is provided with an absorbent core 26, liquid impervious backsheet 24, and a liquid pervious cover material 56 enveloping the backsheet 24 and the absorbent core 26. The sanitary napkin in this alternative embodiment differs from the sanitary napkin embodiments previously described in that the liquid pervious cover material 56 (previously referred to as topsheet 22) passes completely around the absorbent core 26, with the liquid impervious backsheet 24 being interposed between absorbent core 26 and bottom layer of cover material 56. Another possible embodiment (not shown) includes one in which the absorbent core is essentially completely wrapped with topsheet before it is placed on a backsheet.

While particular embodiments of the present invention have been illustrated and described, it would be obvious to those skilled in the art that various other changes and modifications can be made without departing from the spirit and scope of the invention.

CLAIMS

1. A sanitary napkin having two longitudinal edges and two transverse edges, the sanitary napkin comprising a liquid pervious topsheet having two longitudinal edges and two transverse edges, a liquid impervious backsheet having two longitudinal edges and two transverse edges, and an absorbent core intermediate said topsheet and said backsheet, characterized in that

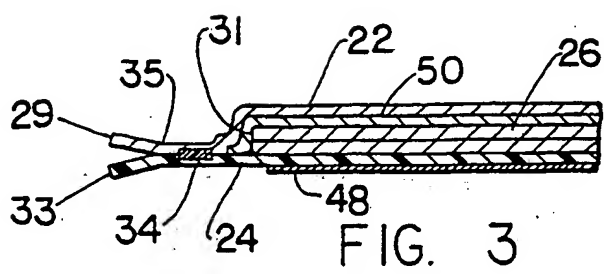
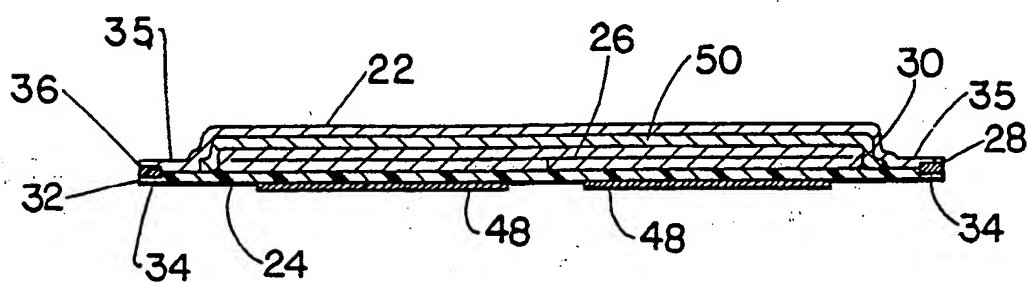
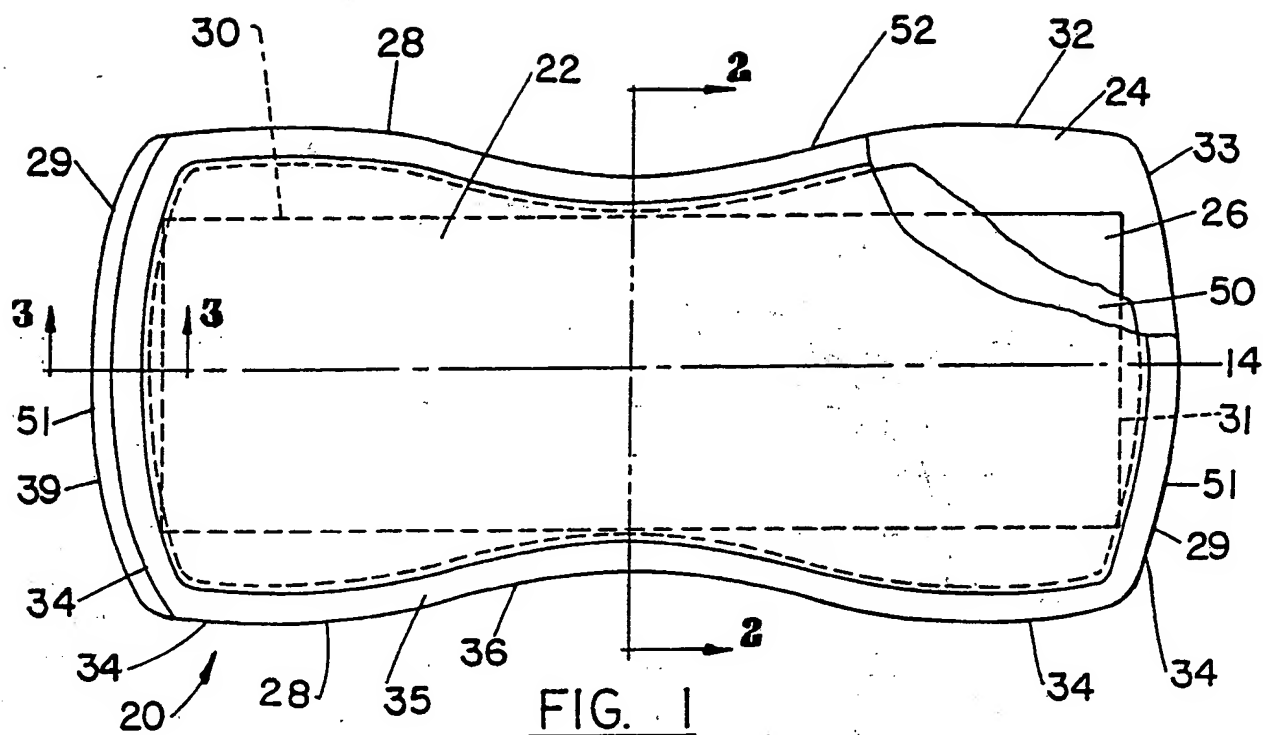
the topsheet and backsheet are peripherally joined outboard of said absorbent core along a seam which is spaced inboard of at least one of said topsheet transverse edges or one of said backsheet transverse edges a distance of at least about 1.0 mm so that unbonded topsheet or backsheet material forms at least one of the transverse edges of the sanitary napkin.

2. The sanitary napkin of Claim 1 wherein the absorbent core has longitudinal and transverse edges, and the sanitary napkin has a border formed by the extension of at least one of the topsheet or the backsheet beyond the longitudinal and transverse edges of the absorbent core, said border encircling said absorbent core and having two longitudinal and two transverse edges formed by at least a portion of at least one of said topsheet longitudinal and transverse edges or said backsheet longitudinal and transverse edges, wherein said border extends from about 0.3 cm to about 2.0 cm outboard from said absorbent core.

3. The sanitary napkin of Claim 2 wherein said seam is spaced from about 1.5 mm to about 15.0 mm inboard from at least one

4. The sanitary napkin of Claims 2 or 3 wherein said seam is spaced at least about 1.0 mm inboard from the periphery of said border.
5. The sanitary napkin of Claims 2, 3, or 4 wherein said border extends from about 0.5 cm to about 1.5 cm outboard from said absorbent core and wherein said seam is spaced from about 2.0 mm to about 10.0 mm inboard from the periphery of said border.
6. A sanitary napkin according to any of the preceding claims wherein said absorbent core contains from about 5% to about 85% by weight of a hydrogel-forming polymer gelling agent.
7. A sanitary napkin according to any of the preceding claims wherein said sanitary napkin has a caliper of less than about 2.6 mm.
8. A sanitary napkin according to any of the preceding claims further comprising a means for attaching said sanitary napkin to the undergarment of the wearer.
9. The sanitary napkin of Claim 8 having a longitudinal axis wherein said means for attaching said sanitary napkin to the undergarment of the wearer comprises two strips of adhesive, one said strip of adhesive disposed on each side of the longitudinal axis of said sanitary napkin.
10. The sanitary napkin of Claim 11 having two longitudinal edges wherein said means for attaching said sanitary napkin to the undergarment of the wearer further comprises two laterally extending flaps, one said flap extending laterally outwardly from each longitudinal edge of said sanitary napkin.

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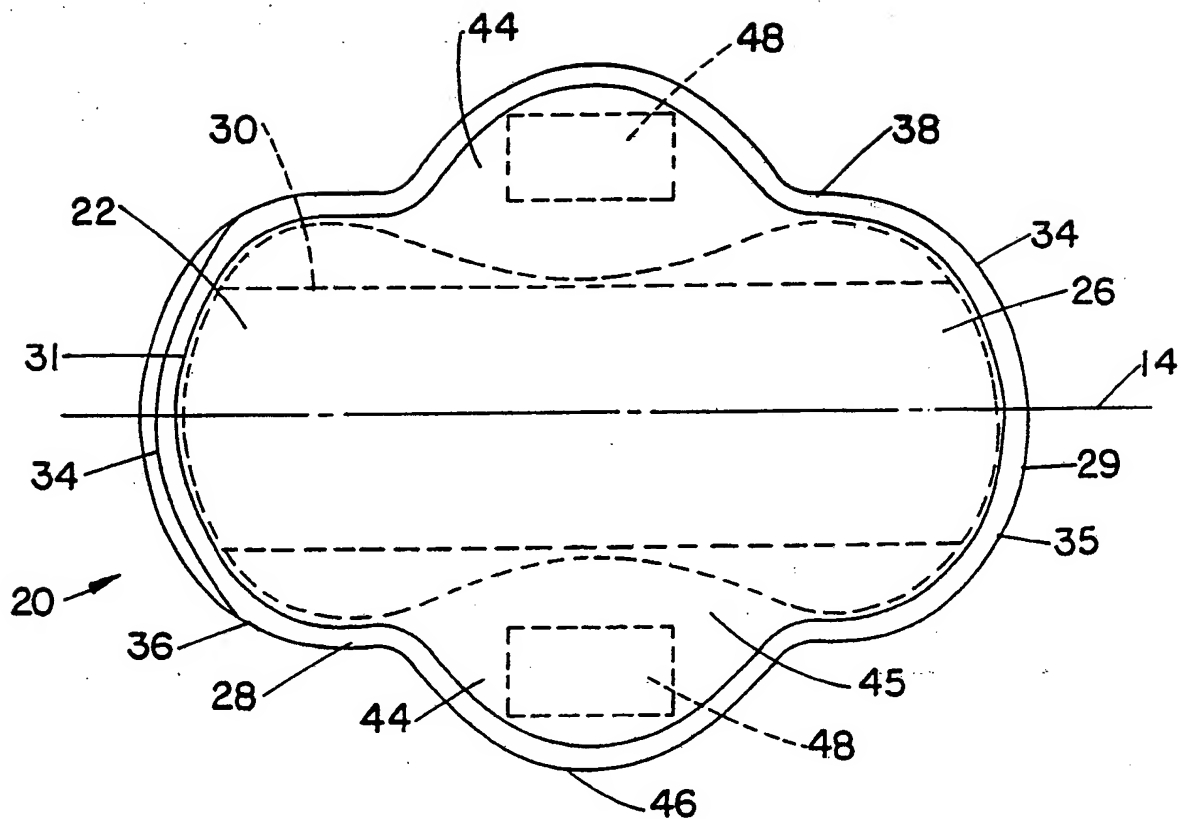


FIG. 4

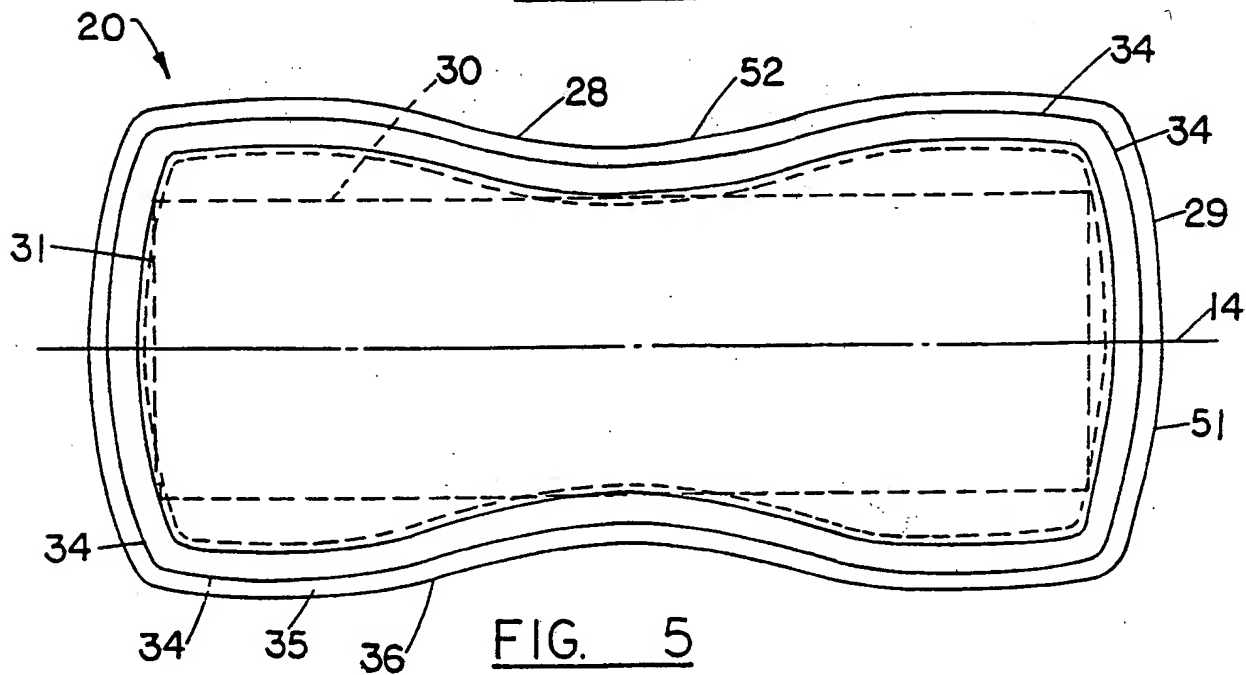
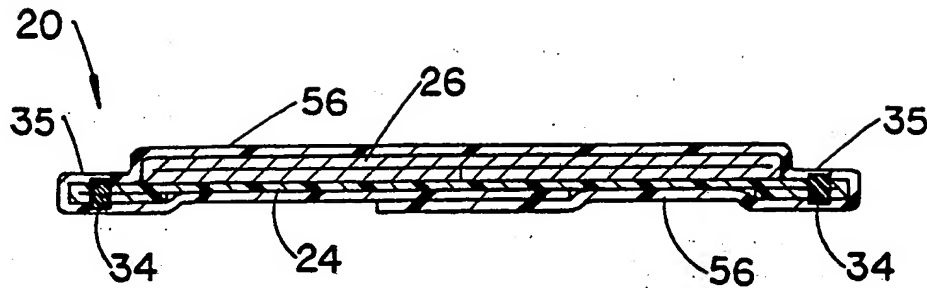
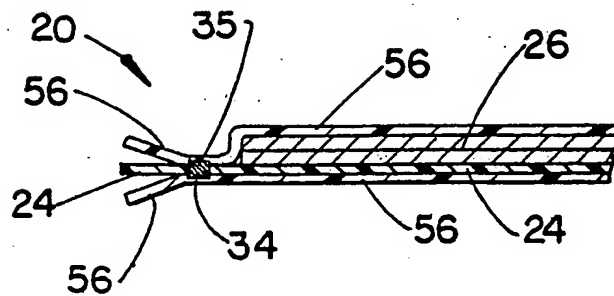


FIG. 5



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FIG. 6FIG. 7

**I. CLASSIFICATION OF SUBJECT MATTER** (if several classification symbols apply, indicate all)<sup>6</sup>

According to International Patent Classification (IPC) or to both National Classification and IPC

Int.Cl. 5 A61F13/15

**II. FIELDS SEARCHED**Minimum Documentation Searched<sup>7</sup>

Classification System

Classification Symbols

Int.Cl. 5

A61F

Documentation Searched other than Minimum Documentation  
to the Extent that such Documents are Included in the Fields Searched<sup>8</sup>**III. DOCUMENTS CONSIDERED TO BE RELEVANT<sup>9</sup>**

Category <sup>10</sup>	Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages <sup>12</sup>	Relevant to Claim No. <sup>13</sup>
X	US,A,4 701 177 (L.C.ELLIS ET AL.) October 20, 1987	1-9
Y	see abstract see column 4, line 35 - line 41 see column 4, line 57 - line 59 see column 7, line 36 - line 47; figures 4-7	10
X	FR,A,2 400 887 (KIMBERLY-CLARK) March 23, 1979 see page 5, line 4 - line 15 see page 8, line 7 - line 12; claim 1; figure 1	1-3,8-9
X	GB,A,2 098 871 (KIMBERLY-CLARK) December 1, 1982 see abstract see page 2, line 29 - line 34; figure 4	1-3
Y	EP,A,0 280 998 (PERSONAL PRODUCTS) September 7, 1988 see abstract; figure 1	10
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<sup>10</sup> Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"A" document member of the same patent family

**IV. CERTIFICATION**

Date of the Actual Completion of the International Search

25 SEPTEMBER 1991

Date of Mailing of this International Search Report

- 9. 10. 91

International Searching Authority

EUROPEAN PATENT OFFICE

Signature of Authorized Officer

NICE P.

P. R. Nica

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)		
Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.
A	EP,A,0 336 578 (PROCTER & GAMBLE) October 11, 1989 see abstract ---	7

# ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO.

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.  
The members are as contained in the European Patent Office EDP file on  
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